PA. :NT COOPERATION TREAT

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark Office, PCT
2011 South Clark Place Room CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 07 February 2001 (07.02.01)	
International application No. PCT/AU00/00644	**Applicant's or agent's file reference** 2601C
International filing date (day/month/year) 08 June 2000 (08.06.00)	**Priority date** (day/month/year) 08 June 1999 (08.06.99)
Applicant MORRIS, James, Frederick	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

05 January 2001 (05.01.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer A. Karkachi
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 December 2000 (14.12.2000)

PCT

(10) International Publication Number
WO 00/75906 A1

(51) International Patent Classification[7]: G08G 1/042, E01F 11/00

(21) International Application Number: PCT/AU00/00644

(22) International Filing Date: 8 June 2000 (08.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PQ 0851 8 June 1999 (08.06.1999) AU

(71) Applicant and
(72) Inventor: MORRIS, James, Frederick [AU/AU]; 15 Koorong Street, Berowra, New South Wales 2081 (AU).

(74) Agent: H.R. HODGKINSON & CO.; Level 3, 20 Alfred Street, Milsons Point, New South Wales 2061 (AU).

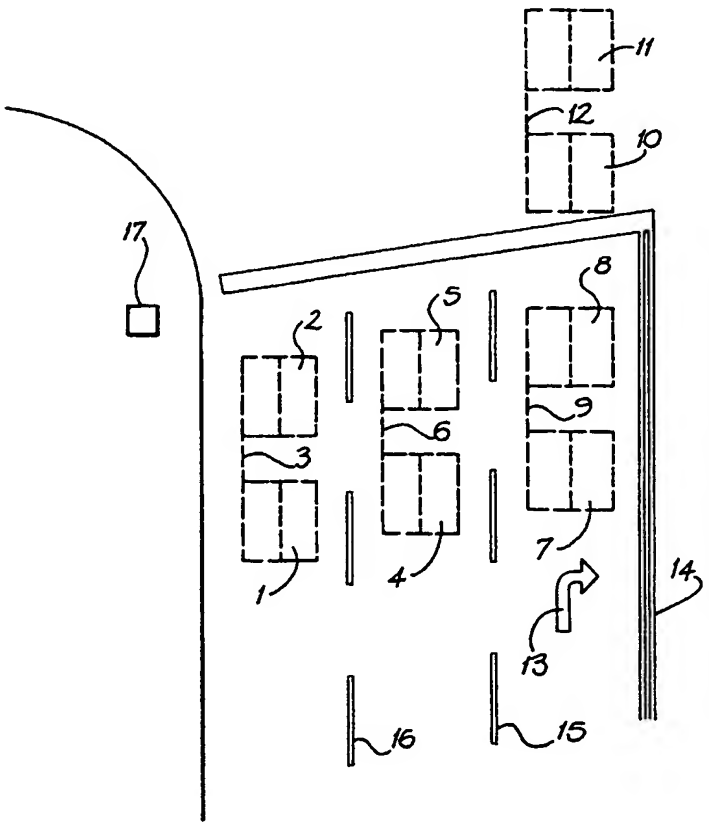
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

[Continued on next page]

(54) Title: IMPROVEMENTS IN ELECTROMAGNETIC TRAFFIC SIGNAL DETECTION



(57) Abstract: An electromagnetic traffic signal detection or traffic control system which includes one or more electromagnetic traffic signal detection loops of an electrically conducting material contained within a pavement or road structure operatively connected to traffic control lights or to other traffic control or regulating means, whereby the electromagnetic signal disturbance created by the magnetic field of a metal-containing vehicle passing over the loop activates the traffic control or regulating means.

WO 00/75906 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

IMPROVEMENTS IN ELECTROMAGNETIC TRAFFIC SIGNAL DETECTION

TECHNICAL FIELD

The present invention relates to improvements in electromagnetic traffic signal detection wherein a loop of electrically conducting material is laid on or set into the pavement surface of a roadway or the like. The loop provides means to detect the presence of a motor vehicle or the like passing thereover by means of the disturbance of the electromagnetic signal by the metal body of the vehicle passing over the underlying loop. The disturbance of the electromagnetic signal can be used to activate traffic lights, a boom gate, or the like.

BACKGROUND ART

Electromagnetic signal detection systems are one of several means for detecting the presence of motor vehicles or the like and for controlling or regulating traffic flow. Other detection means include but are not limited to infra-red systems wherein a passing vehicle breaks a beam of infra-red light between two pre-determined points, and pressure-sensitive systems, wherein the weight of a vehicle passing over a pressure-sensitive detector set in or on the road pavement activates the traffic lights, boom gate or other traffic control means.

Electromagnetic signal detection systems are perhaps now the mostly widely used traffic control or traffic regulating system because of their adaptability or versatility, their cost compared to other systems, and their reliability. This is especially so in applications for traffic control on public roads and car parking stations. However, the cost of installation of such electromagnetic signal detection/traffic control systems is relatively high, being both labour intensive and capital equipment intensive, as well as being time consuming.

Existing electromagnetic traffic signal detection loops are retrofitted to the road pavement after the pavement has been laid. This requires that a groove be saw cut into the pavement base or surface layer which damages the integrity of the road pavement, manually installing a loop within the groove and then sealing the groove with a settable filling

material. This process is very labour intensive and time consuming. Further, it has a potential for environmental pollution, and control measures are required to prevent the asphalt and water slurry from the saw cutting from entering the stormwater system, including sediment control weirs and filters.

European Patent EP 0425977 (Beck, Werner) discloses an induction loop for installation in or under the road surface for the automatic operation of switchgear for traffic control means, wherein the electronically conductive material of the induction loop is contained within an open-sided channel or conduit which serves to protect the induction loop but adds bulk which has the effect of making the system more difficult or more time-consuming and costly to install.

Us Patent No 5,008,666 (Gerbert et al) discloses a traffic detection or measurement device including coaxial cables embedded in a polymer matrix together with a vehicular presence detector to indicate data such as vehicle count, vehicle length, vehicle time of arrival, vehicle speed, number of axles per vehicle, axle distance per vehicle, vehicle gap, headway and axle weights. This device is too sophisticated for general application and is difficult or time-consuming and costly to install.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide an improved installation method for an electromagnetic traffic signal detection or traffic control system which goes at least some way towards overcoming or at least minimising the prior art problems or limitations referred to above.

It is another object of this invention to provide an improved electromagnetic traffic signal or traffic control system which is universally adaptable for use in most traffic control applications.

It is a further object of this invention to provide an improved electromagnetic traffic signal detection or traffic control system which is relatively simple and inexpensive to

manufacture, is easier and less expensive to install than existing systems, and is simple and reliable in operation.

These and other objects of this invention will become more apparent from the following descriptions and the drawings.

According to one aspect of this invention there is provided an electromagnetic traffic signal detection or traffic control system which includes one or more electromagnetic traffic signal detection loops comprising a pre-formed or pre-wound electrically conducting material in one or more interconnected loops of a predetermined configuration, encapsulated in a protective coating or layer, such as a protective bandage, or by other suitable insulating means, such that the signal detection loops may be inlaid as a single unit within the pavement structure, such as during the construction of the road, or during maintenance or repair thereon. The signal detection loops are operatively connected to traffic signals, a boom gate, or other traffic control or regulating means, whereby the electromagnetic signal disturbance created by the magnetic field of a metal vehicle passing over the loop activates the traffic control or regulating means.

This invention will now be further described by way of example only with reference to the accompanying drawings, wherein

FIG. 1 is a plan view of a typical traffic signal detection loop installation according to one embodiment of the invention;

FIG. 2 is a cross-sectioned view of a section of a typical road pavement construction, showing a cross-section through one section of a traffic detection loop laid on the road pavement base, encased in a protective bandage and covered by a top coat of asphalt; and

FIG. 3 is a cross-sectional view through one section as installed in a concrete road pavement.

BEST MODE OF CARRYING OUT THE INVENTION

FIG. 1 is a plan view of a typical traffic signal detection loop installation according to one embodiment of the invention, shown in a 'drive on the left' situation such as in Australia, New Zealand and the United Kingdom. The invention is, however, equally applicable to a 'drive on the right' situation such as in the United States of America and Continental Europe.

FIG. 1 illustrates a three-lane carriageway at the intersection with a cross-street. Induction loops 1 and 2 interconnected by electrically conductive cable 3 are installed in the inside lane adjacent to the kerb. Loops 4 and 5 in the middle lane are interconnected via cable 6. Loops 7 and 8 in the outside lane are interconnected by cable 9. Right-turn traffic from the outside lane passes over loops 10 and 11, interconnected by cable 12 within the intersection area. The right-turn arrow 13 marked on the road surface in the outside lane directs right-turn traffic over the right-turn approach loops 8 and 9, and the right-turn departure loops 10 and 11. The lanes are marked on the road pavement surface by means of centre-line 14 and lane dividers 15 and 16. All of the loops 1 to 11 are operatively connected to the traffic lights junction box 17 adjacent to the corner or intersection.

FIG. 2 is a cross-sectional view of a portion of a typical road pavement, showing a cross-section through one section of a traffic detection loop. A bitumen impregnated geotextile base bandage 18 is laid on the road pavement base 24 (and underlying sub grade 25) and electrical conducting material or sensor wires 19 are laid on the base bondage 18 and held in place by encapsulation tape 20. The whole assembly is attached to the road base 24 by means of by a bitumenous adhesion bandage 21, and is then covered by a bitumen surface layer 22 typically 40mm to 150mm in thickness.

FIG. 3 is an isometric cut-away view of a portion of a traffic detection loops showing the composite structure in more detail.

As shown in the drawings relating to this embodiment of the invention, the electromagnetic traffic signal detection loops are pre-wound and encapsulated in a protective bandage so that they may be inlaid as a single unit within the pavement structure during the construction of the road.

Each set of loops comes packed as a single unit, ready to install.

Installation of loops to the road base course takes a fraction of the time that is required for the installation of loops that are *cut* into the surface of the road.

Because the loops are encapsulated in a protective membrane or bandage, they can be exposed to vehicular traffic for a number of days after installation, without damage to the loop wires.

The loops are installed between the layers of asphalt during the construction of the asphalt road pavement. Therefore eliminating the need to saw cut the road surface, which adversely affects the integrity of the pavements structure. Ezy Loops can be installed on to any sound flat surface, then overlaid with an asphalt wearing course.

The loops can be installed into a concrete road pavement during construction by tying the loop to the top layer of reinforcing steel mesh.

Advantages of this method of installation of electromagnetic traffic signal detection loops include:-

- no electrical certification required for installation of the loops to the road base;
- no power tools are required for installation of the loops;
- the loops can be formed to suit any traffic lane width and any traffic carriageway, including for example conventional motor vehicle traffic, light rail, parking station entrances, to name a few; and
- the loops can be formed to suit any electromagnetic loop configuration. Standard widths are, for example, 1.6m, 1.8m, 2.0m and 2.2m.

The bandage encapsulated loop ensures that the loop remains in the desired shape or configuration, and serves to protect the wires of the loop during transportation and installation, such as during periods when the loop is laid out on the pavement and exposed to traffic, but is not yet covered by the top layer of asphalt and is exposed or left open to vehicular traffic.

The bandage used to adhere the loops to the road base with the assistance of a light rubber roller. No other processes are required to adhere the loops to the base. The loops can be adhered to a cold base, (i.e. profiled concrete or old asphalt pavement).

Installation onto Base Course

Once the base course has been prepared, i.e. profiled, milled and cleaned in the case of an existing pavement, or layed and rolled in the case of a new pavement, remove the loops from their packing unfold them and place them on the ground in the correct position over the marks. Secure the loops by using the protective bandage. Using a hand roller, roll the loops so that they adhere to the base. Lay the leader wires out so that they intersect the lip of gutter adjacent to the PJ box. Cut a piece of bitumen bandage the length of the leader wires, peel the backing paper off and lay the bandage over the wires. Use the roller to press the bandage down. Remove the corking from the conduit leading to the PJ Box and feed the leader wires through. Recork the gutter groove and conduit. The surface layer of asphalt can now be laid over the loops and rolled. This method can be used if the temperature of the base course is over 100℃, but it is preferable that the temperature is below 80℃.

Although an exemplary embodiment of the present invention has been shown and described, it will be apparent to those having ordinary skill in the art that a number of changes, modifications or alterations to the invention described herein may be made, none of which depart from the spirit of the present invention. All such changes, modifications, and alterations should therefore be seen as being within the scope of the present invention.

It should be appreciated that the present invention provides a substantial advance in electromagnetic traffic signal detection and traffic control providing all of the herein-described advantages without incurring any relative disadvantages.

CLAIMS

1. An electromagnetic traffic measurement system, which includes one or more electromagnetic induction loops comprising a pre-formed or pre-wound electrically conducting material in one or a plurality of interconnected loops of a predetermined configuration, encapsulated in an outer layer or bandage adapted for adhesion to a road or pavement base as a complete composite loop configuration prior to application of a covering surface layer to the road or pavement base.

2. An electromagnetic traffic measurement system as claimed in claim 1, operatively connected to traffic monitoring or to traffic control or regulating means.

3. An electromagnetic traffic measurement system as claimed in claim 1 or claim 2, operatively connected to traffic signals or to a gate control.

4. An electromagnetic traffic measurement system as claimed in any one of the proceeding claims, wherein the outer layer or bandage comprises a bitumen impregnated geotextile base bandage adapted to support one or a plurality of electrically conducting wires or cables, an upper encapsulation tape, and an overlying adhesion bandage for securing the encapsulated loop to the underlying pavement base.

5. An electromagnetic traffic measurement system as claimed in claim 4 wherein the pre-formed composite loop is provided in ready-to-use form for attachment to a road pavement base.

6. A method of installation of an electromagnetic traffic measurement system of the type defined in claim 1, wherein a pre-formed encapsulated electromagnetic induction loop is attached to a road or pavement base in a predetermined configuration or position, the loop is operatively connected to traffic control or regulating means and a surface layer of asphalt or other pavement surfacing

material is applied to the road or pavement base to cover and seal the said loop within the road or pavement.

7. A method as claimed in claim 6 wherein the encapsulated electromagnetic induction loop is attached to the top layer of reinforcing steel mesh in the road pavement base before being overlaid with asphalt or other pavement surfacing material.

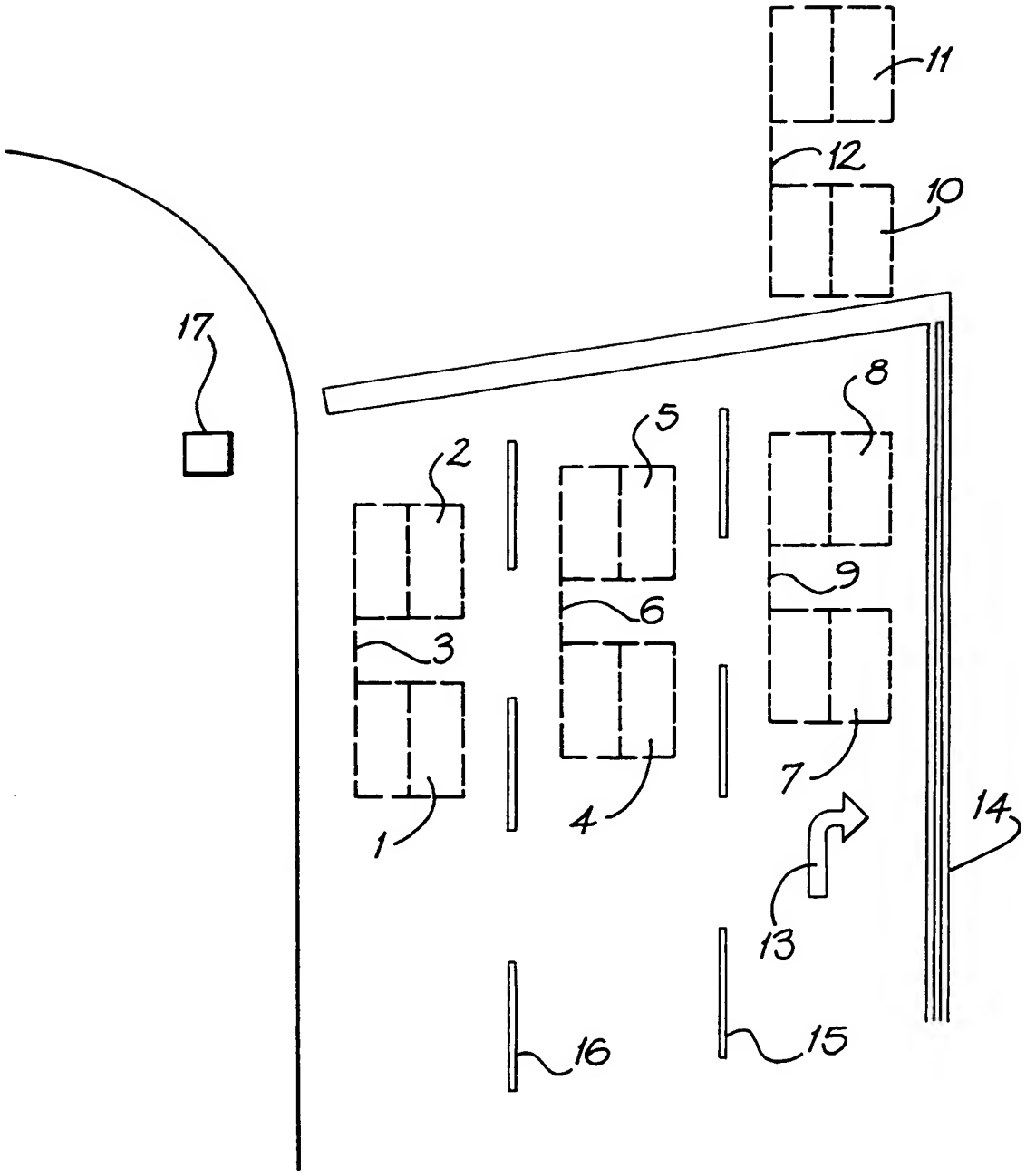


FIG. 1

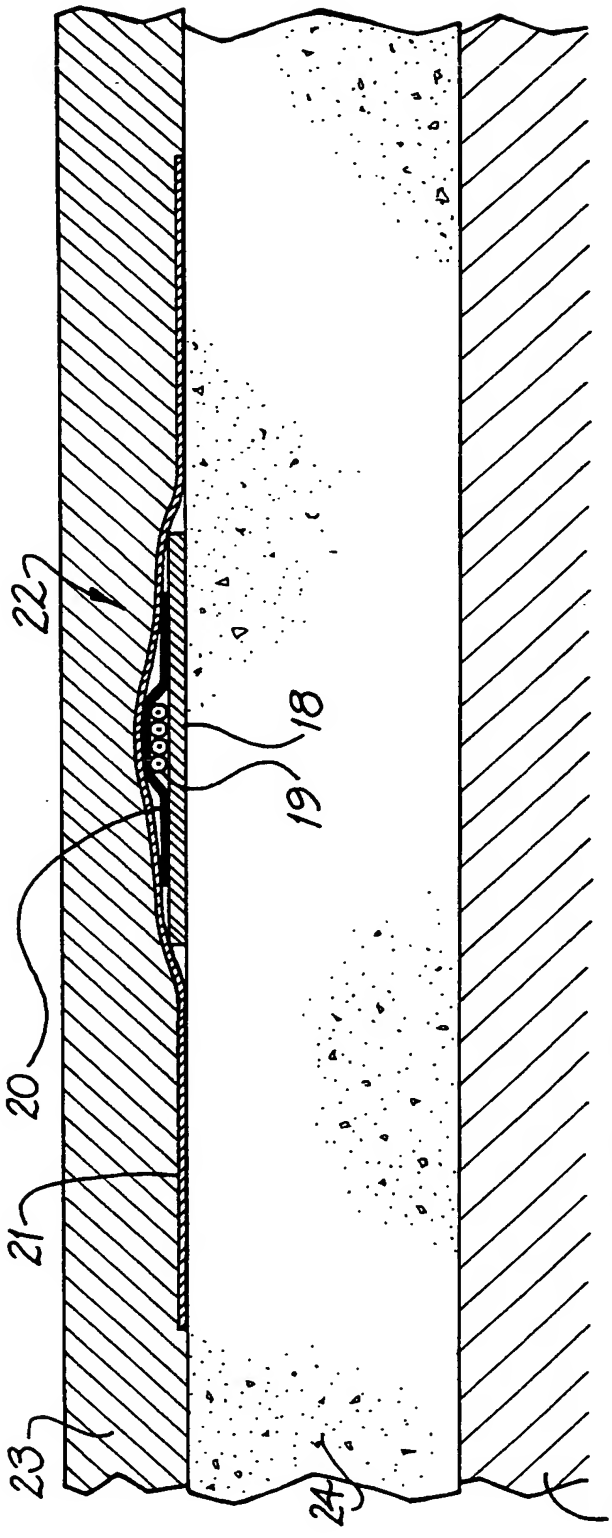


FIG. 2

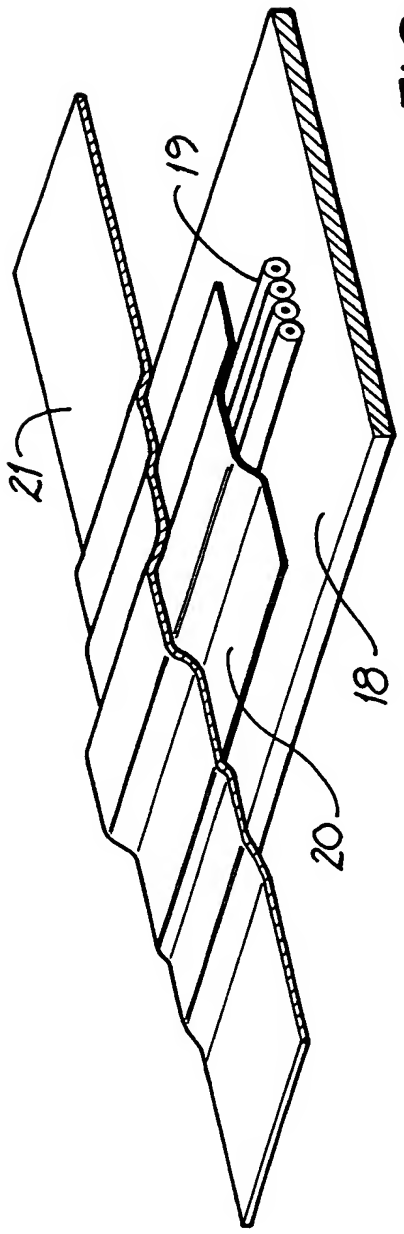


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU00/00644

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G08G 1/042, E01F 11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC : G08G 1/042, E01F 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : IPC AS ABOVE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, USPTO Web Patent Database, Esp@cenet, "install, surface, loop, inductive, adhere, detector etc"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4945356 A (HENDERSON et al.) 31 July 1990 Refer to Column 4 (lines 38,39), column 5 (lines 21-37) and figures 5 & 10 in particular.	1-3,6-7

☐ Further documents are listed in the continuation of Box C ☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 July 2000	- 7 AUG 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **P. THONG** Telephone No : (02) 6283 2128

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2601C PLP/CO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU00/00644**	International Filing Date *(day/month/year)* 8 June 2000	Priority Date *(day/month/year)* 8 June 1999
International Patent Classification (IPC) or national classification and IPC **Int. Cl.** [7] G08G 1/042, E01F 11/00		
Applicant MORRIS, James Frederick		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand 5 January 2001	Date of completion of the report 1 June 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **P. THONG** Telephone No. (02) 6283 2128

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU00/00644

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.

☒ the description, pages 1-7, as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 8,9, received on 23 May 2001 with the letter of 23 May 2001

☒ the drawings, pages 1/2,2/2, as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU00/00644

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-9	YES
	Claims		NO
Inventive step (IS)	Claims	1-9	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-9	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

US 4945356 (HENDERSON) 31 July 1990

The citation does not disclose the claimed subject matter. Therefore the subject matter of the claims is new and meets the requirements of Article 33(2) PCT with regard to the requirement for novelty. The subject matter of the claims is not obvious and meets the requirements of Article 33(3) PCT with regard to the requirement for inventive step. The subject matter is also industrially applicable.

CLAIMS

1. An electromagnetic traffic measurement or traffic control system, which includes one or more electromagnetic induction loops comprising a pre-formed or pre-wound insulated electrically conducting material in one or a plurality of interconnected loops of a predetermined configuration, encapsulated in an outer layer or bandage adapted for adhesion to a road or pavement base as a complete composite loop configuration prior to application of a covering surface layer to the road or pavement base, wherein the outer layer or bandage comprises a bitumen impregnated geotextile base bandage adapted to support one or a plurality of insulated electrically conducting wires or cables, an upper encapsulation tape, and an overlying adhesion bandage for securing the encapsulated loop to the underlying pavement base.

2. An electromagnetic traffic measurement or traffic control system as claimed in claim 1, operatively connected to traffic monitoring or to traffic control or regulating means.

3. An electromagnetic traffic measurement or traffic control system as claimed in claim 1 or claim 2, operatively connected to traffic signals or to a gate control.

4. An electromagnetic traffic measurement or traffic control system as claimed in claim 1, wherein the pre-formed composite loop is provided in ready-to-use form for attachment to a road pavement base.

5. A method for installation of an electromagnetic traffic measurement or traffic control system of the type defined in claim 1, wherein a pre-formed encapsulated electromagnetic induction loop is attached to a road or pavement base in a predetermined configuration or position, the loop is operatively connected to traffic control or regulating means and a surface layer of asphalt or other pavement surfacing material is applied to the road or pavement base to cover and seal the said loop within the road or pavement.

6. A method as claimed in claim 5, wherein the encapsulated electromagnetic induction loop is attached to the top layer of reinforcing steel mesh in the road pavement base before being overlaid with asphalt or other pavement surfacing material.

7. An electromagnetic traffic measurement or traffic control system, which includes one or more electromagnetic induction loops comprising a pre-formed or pre-wound insulated electrically conducting material in one or a plurality of interconnected loops of a predetermined configuration, encapsulated in an outer protective layer adapted for attachment to a road or pavement surface, wherein said one or more electromagnetic induction loops is operatively connected to traffic monitoring or to traffic control or regulating means, wherein the outer layer or bandage comprises a bitumen impregnated geotextile base bandage adapted to support one or a plurality of insulated electrically conducting wires or cables, an upper encapsulation tape, and an overlying adhesion bandage for securing the encapsulated loop to a road or pavement surface.

8. An electromagnetic traffic measurement or traffic control system as claimed in claim 7, operatively connected to traffic signals or to a gate control.

9. An electromagnetic traffic measurement or traffic control system as claimed in claim 8 or claim 9, when used to measure or control traffic flow within a car park.

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

HODGKINSON OLD McINNES
Level 3, 20 Alfred Street
MILSONS POINT NSW 2061

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

	Date of mailing *day/month/year* 06 JUN 2001
Applicant's or agent's file reference 2601C PLP/CO	**IMPORTANT NOTIFICATION**

International Application No.	International Filing Date	Priority Date
PCT/AU00/00644	8 June 2000	8 June 1999

Applicant
MORRIS, James Frederick

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translations to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide

Name and mailing address of the IPEA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	P. THONG Telephone No. (02) 6283 2128

14

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2601C PLP/CO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU00/00644**	International Filing Date *(day/month/year)* 8 June 2000	Priority Date *(day/month/year)* 8 June 1999

International Patent Classification (IPC) or national classification and IPC

Int. Cl. [7] G08G 1/042, E01F 11/00

Applicant

MORRIS, James Frederick

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

[X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of **2** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
5 January 2001	1 June 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **P. THONG** Telephone No. (02) 6283 2128

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU00/00644

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed.

☒ the description, pages **1-7,** as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **8,9,** received on **23 May 2001** with the letter of **23 May 2001**

☒ the drawings, pages **1/2,2/2,** as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims **1-9**	**YES**
	Claims	**NO**
Inventive step (IS)	Claims **1-9**	**YES**
	Claims	**NO**
Industrial applicability (IA)	Claims **1-9**	**YES**
	Claims	**NO**

2. Citations and explanations (Rule 70.7)

US 4945356 (HENDERSON) 31 July 1990

The citation does not disclose the claimed subject matter. Therefore the subject matter of the claims is new and meets the requirements of Article 33(2) PCT with regard to the requirement for novelty. The subject matter of the claims is not obvious and meets the requirements of Article 33(3) PCT with regard to the requirement for inventive step. The subject matter is also industrially applicable.

CLAIMS

1. An electromagnetic traffic measurement or traffic control system, which includes one or more electromagnetic induction loops comprising a pre-formed or pre-wound insulated electrically conducting material in one or a plurality of interconnected loops of a predetermined configuration, encapsulated in an outer layer or bandage adapted for adhesion to a road or pavement base as a complete composite loop configuration prior to application of a covering surface layer to the road or pavement base, wherein the outer layer or bandage comprises a bitumen impregnated geotextile base bandage adapted to support one or a plurality of insulated electrically conducting wires or cables, an upper encapsulation tape, and an overlying adhesion bandage for securing the encapsulated loop to the underlying pavement base.

2. An electromagnetic traffic measurement or traffic control system as claimed in claim 1, operatively connected to traffic monitoring or to traffic control or regulating means.

3. An electromagnetic traffic measurement or traffic control system as claimed in claim 1 or claim 2, operatively connected to traffic signals or to a gate control.

4. An electromagnetic traffic measurement or traffic control system as claimed in claim 1, wherein the pre-formed composite loop is provided in ready-to-use form for attachment to a road pavement base.

5. A method for installation of an electromagnetic traffic measurement or traffic control system of the type defined in claim 1, wherein a pre-formed encapsulated electromagnetic induction loop is attached to a road or pavement base in a predetermined configuration or position, the loop is operatively connected to traffic control or regulating means and a surface layer of asphalt or other pavement surfacing material is applied to the road or pavement base to cover and seal the said loop within the road or pavement.

6. A method as claimed in claim 5, wherein the encapsulated electromagnetic induction loop is attached to the top layer of reinforcing steel mesh in the road pavement base before being overlaid with asphalt or other pavement surfacing material.

7. An electromagnetic traffic measurement or traffic control system, which includes one or more electromagnetic induction loops comprising a pre-formed or pre-wound insulated electrically conducting material in one or a plurality of interconnected loops of a predetermined configuration, encapsulated in an outer protective layer adapted for attachment to a road or pavement surface, wherein said one or more electromagnetic induction loops is operatively connected to traffic monitoring or to traffic control or regulating means, wherein the outer layer or bandage comprises a bitumen impregnated geotextile base bandage adapted to support one or a plurality of insulated electrically conducting wires or cables, an upper encapsulation tape, and an overlying adhesion bandage for securing the encapsulated loop to a road or pavement surface.

8. An electromagnetic traffic measurement or traffic control system as claimed in claim 7, operatively connected to traffic signals or to a gate control.

9. An electromagnetic traffic measurement or traffic control system as claimed in claim 8 or claim 9, when used to measure or control traffic flow within a car park.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU00/00644

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G08G 1/042, E01F 11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC : G08G 1/042, E01F 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : IPC AS ABOVE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, USPTO Web Patent Database, Esp@cenet, "install, surface, loop, inductive, adhere, detector etc"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4945356 A (HENDERSON et al.) 31 July 1990 Refer to Column 4 (lines 38,39), column 5 (lines 21-37) and figures 5 & 10 in particular.	1-3,6-7

☐ Further documents are listed in the continuation of Box C ☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 July 2000	- 7 AUG 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer P. THONG Telephone No : (02) 6283 2128

United States Patent [19]

Henderson et al.

[11] **Patent Number: 4,945,356**

[45] **Date of Patent: Jul. 31, 1990**

[54] **STRIP MATERIAL FOR AND A SURFACE MOUNTED INDUCTIVE LOOP**

[75] Inventors: **Martin C. Henderson, Los Angeles; Ralph J. Koerner, Ramona; William D. Jordan, Jr., Los Angeles, all of Calif.**

[73] Assignee: **Minnesota Mining and Manufacturing Company, St. Paul, Minn.**

[21] Appl. No.: **502,562**

[22] Filed: **Jun. 9, 1983**

[51] **Int. Cl.**[5] **G08G 1/01**

[52] **U.S. Cl.** **340/941**; 340/933

[58] **Field of Search** ..... 340/941, 905, 51, 52 R, 340/568, 933; 377/9; 343/897

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,047,860	7/1962	Swallow et al.	343/897
3,132,114	9/1955	Somigliana	260/28.5
3,609,678	9/1971	Fayling	340/905
3,723,988	3/1973	Kardashian	340/941
3,748,443	7/1973	Kroll et al.	377/9
3,943,339	3/1976	Koerner et al.	235/92
3,984,764	10/1976	Koerner	324/41
3,989,932	11/1976	Koerner	235/92
4,080,085	3/1978	Dickson	404/14
4,117,192	9/1978	Jorgensen	428/337
4,449,115	5/1984	Koerner	340/941

FOREIGN PATENT DOCUMENTS

2015875	4/1970	Fed. Rep. of Germany	340/941
7345069	12/1973	France	340/941

OTHER PUBLICATIONS

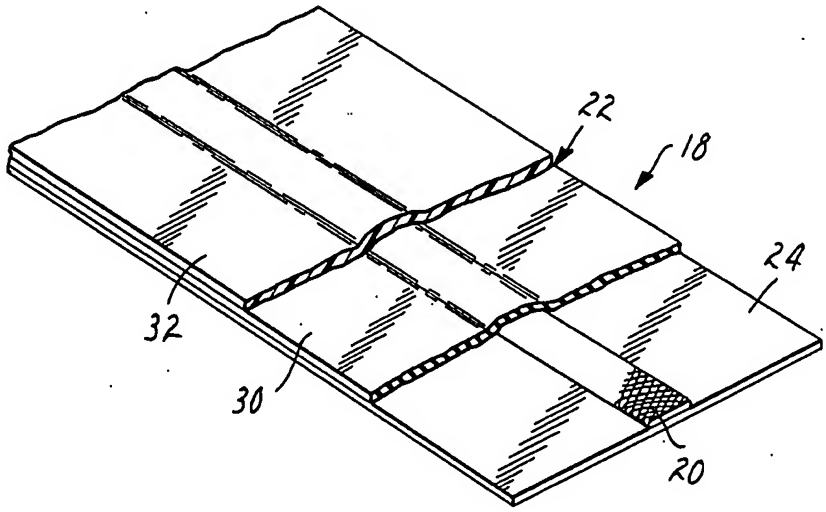
Originator: Golden River Corporation, Title: Adhesive Surface Loop Kit and Thermoplastic Surface Loop Kit.
Originator: Geo Merkel GmbH & Co. KG, Title: Induktionsplatte.
Originator: Universal Autopayment Ltd., Title: Vehicle Detector 4BA.

Primary Examiner—Alvin Oberley
Assistant Examiner—M. Fatahiyar
Attorney, Agent, or Firm—Donald M. Sell; Walter N. Kirn; William D. Bauer

[57] **ABSTRACT**

A strip material (18) for forming an inductive loop (10) adapted to be applied to the surface of a roadway (12). The strip material (18) consists of and the loop (10) is formed from a ductile, flexible, flattened, extensible conductor (20) and a protective covering (22). A protective underlayment (24) is optional. The conductor (20) may be formed from a compressed, flattened metallic wire braid (28) or from a wire mesh containing 25% to 75% voids. The protective covering (22) may be formed from either combination unvulcanized elastomer precursor base sheet (30) and a vinyl based polymer support film (32), or a covering (26) selected from the group of epoxy, polyester, urethane and polyurethane.

23 Claims, 4 Drawing Sheets



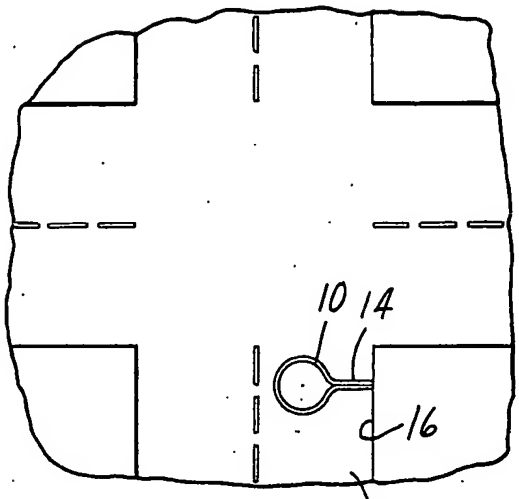


FIG. 1

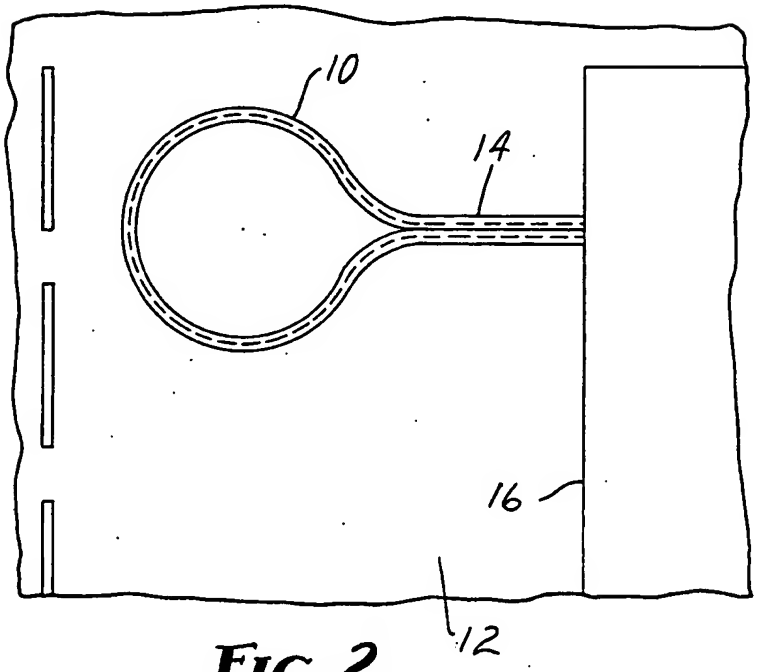


FIG. 2

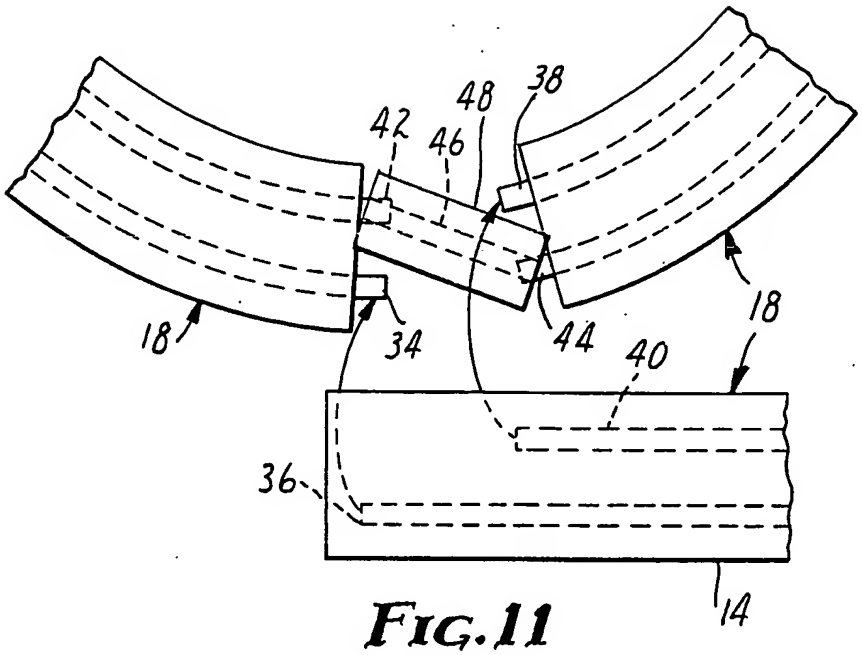


FIG. 11

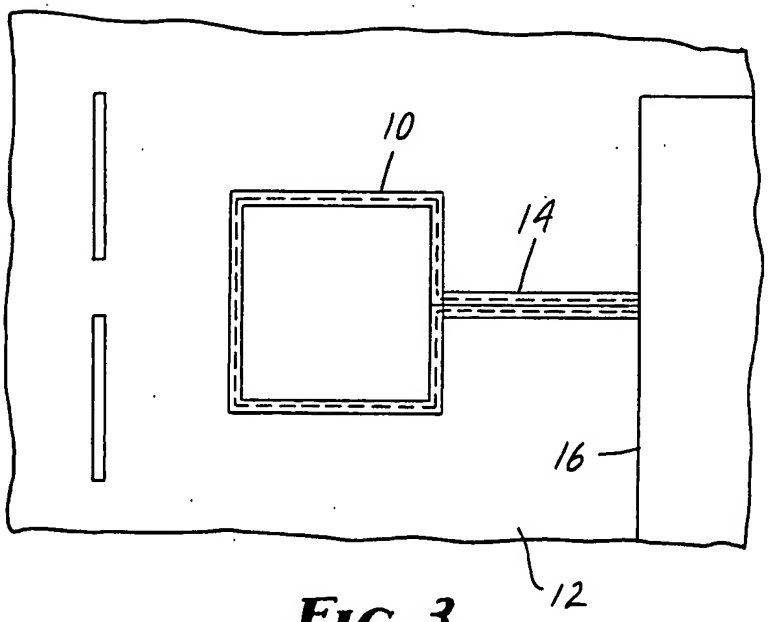


FIG. 3

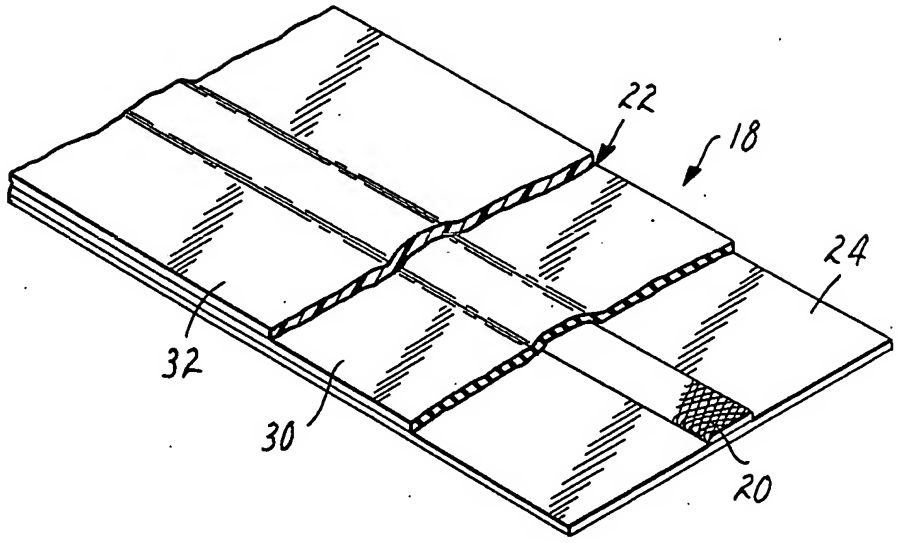


FIG. 5

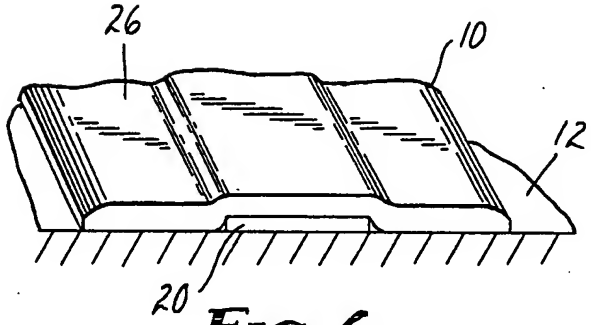


FIG. 6

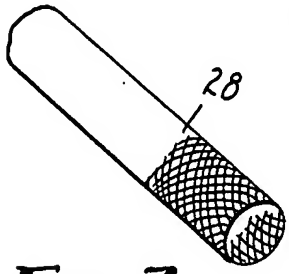


FIG. 7

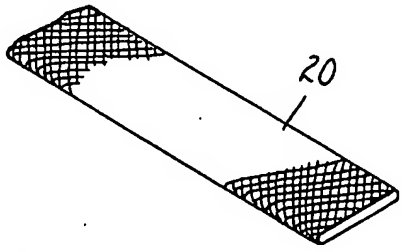


FIG. 8

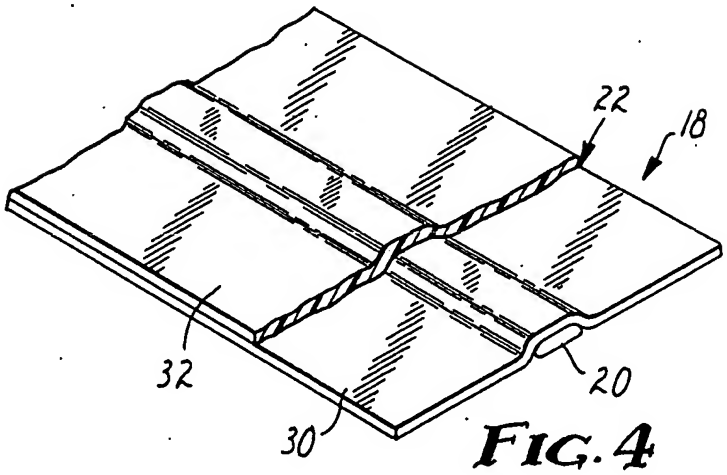


FIG. 4

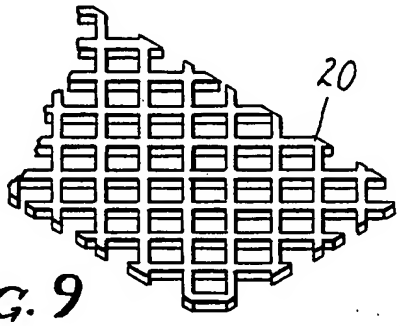


FIG. 9

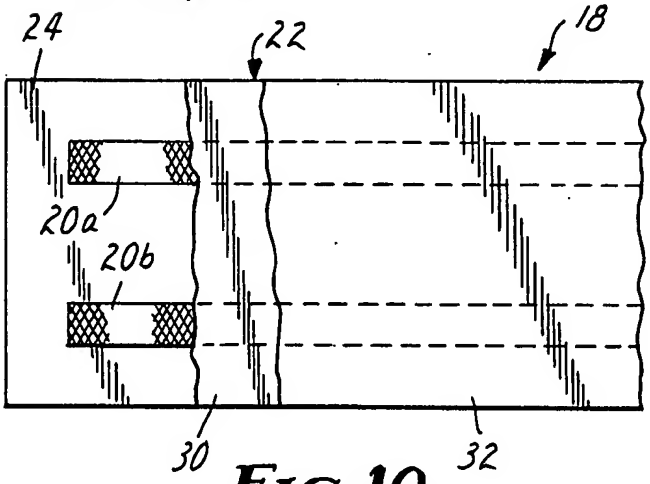


FIG. 10

STRIP MATERIAL FOR AND A SURFACE MOUNTED INDUCTIVE LOOP

BACKGROUND OF THE INVENTION

The present invention relates generally to inductive loops intended for vehicle detection and more particularly to surface mounted inductive loops intended for vehicle detection and more particularly to strip material for forming such loops.

Inductive loops are well known in the art for use in vehicle detection. See for example, U.S. Pat. No. 3,989,932, Koerner, entitled Inductive Loop Vehicle Detector; U.S. Pat. No. 3,984,764, Koerner, entitled Inductive Loop Structure; and U.S. Pat. No. 3,943,339, Koerner, Inductive Loop Vehicle Detector. Generally these loops consist of one of more loops (turns) of a conductive wire embedded under the surface of a roadway over which the vehicle to be detected passes. For example, the inductive loop may be embedded in the street to detect vehicles in the roadway approaching an intersection. Typically, a six foot (1.8 meters) across circular or nearly square loop is utilized along with a lead wire leading from the loop to the side of the roadway. The loop may then be connected via the lead wire to well known devices which typically oscillate the loop at a predetermined frequency and monitor changes in the frequency in order to detect the presence of a vehicle over the inductive loop. Examples of these well known devices are described in the above-referenced patents.

These typical prior art loops which are embedded in the roadway require the cutting of the roadway in order to install the loops. Typically saw cuts are made in the roadway to allow for the installation of the loops. Saw cuts impair the integrity of the roadway and facilitate entry of moisture which may dilatoriously affect the roadway, e.g. during freeze-thaw-freeze cycles, and jeopardize the strength of the roadway by creating a "weak" spot which may facilitate uneven settling or shifting of the roadway under heavy vehicular loads. In some installations it may be impossible to saw cut the surface of the roadway on which the inductive loop is to be installed. An example where this may be the case is a parking ramp constructed from precast, prestressed concrete slabs where the saw cutting of the slabs may seriously weaken the structure.

A few inductive loops exist which are intended for mounting on the surface of a roadway. When surface mounted, the loop is subject to the stress of the vehicular traffic over it, whether it be high speed, heavy truck traffic in a roadway application or turning wheels in a parking application. Further, the surface mounted loop is subject to exposure to the elements in the form of rain, snow and corrosive materials. Still further, the surface mounted loop is subject to the uneven shifting in the roadway and the resultant uneven surface of the roadway to which the loop must conform.

Golden River Corporation of 7315 Redfield Court, Falls Church, Va. has manufactured a surface mounted inductive loop. The loop is a temporary surface loop for vehicle counting and classifying. The loop uses an adhesive, a protective ribbon, a loop wire, plugs and siliconized scissors for installation. The loop uses a standard continuous metallic conductor for forming the loop conductor and hence is relatively inextensible and subject to breakage on stretch as may be caused by the uneven surface or shifting of a roadway.

A device known as an INDUKTIONSPLATTE produced by GEO Merkel GmbH and Co. KG of West Germany uses a preformed detector loop built into a plastic plate and is indicated as suitable for mounting on the surface of a roadway. The plastic plate is relatively inflexible and utilizes a conductor of a uniform copper with a wire size of approximately number AWG 25.5.

Universal Autopayment, Ltd. of Morley Road, Tonbridge, Kent manufactures an inductive loop surface tape which has been designed for use as a substitute for buried loops. The tape comprises 21 specially designed copper strands which provide a multiplicity of conductive paths allowing the loop to continue to function if some of the conductive paths are broken.

These prior art surface mounted inductive loops attempt to solve the breakage problem either by preventing deformation (INDUKTIONSPLATTE) or by providing a multiplicity of paths (Universal Autopayment) such that if some breakage occurs the loop would still function.

SUMMARY OF THE INVENTION

The present invention provides a strip material for forming an inductive loop and an inductive loop adapted to be applied to the surface of a roadway. The inductive loop consists of a loop of ductile, flexible, flattened, extensible conductor and a protective covering adhered to the loop and being capable of adhering the loop to the surface of the roadway. In preferred embodiments the conductor is metallic and is a flattened, braided wire which is longitudinally compressed preferrably to be not more than three-fourths of its extended length. In an alternative embodiment the conductor may be a flattened, braided wire which is constructed from a soft metal such as copper and still preferrably be a wire mesh which has a surface area containing from 25% to 75% voids and wherein such voids may be diamond shaped. In one embodiment the protective covering may have a base sheet, a support film adhered to one surface of the base sheet, and in a preferred embodiment an adhesive affixed to the other side of the base sheet for adhering the wire to the protective covering and for being capable of adhering the inductive loop to the roadway. The base sheet may be an unvulcanized elastomer precursor and the support film may be a vinyl based polymer and may further contain irregular skid resisting particles partially embedded in and partially exposed out of the support sheet. In an alternative embodiment the protective covering may be selected from a group consisting of epoxy, polyester, urethane, and polyurethane and in a preferred embodiment is an ultraviolet curable polyurethane. In another embodiment the inductive loop further has a protective underlayment placed between the conductor and the surface of the roadway which may be insulative and in a preferred embodiment is an adhesive.

The present invention provides a solution for the aforementioned problems in connection with surface mounted inductive loops. The present invention provides a strip material for an inductive loop and an inductive loop intended for surface mounting particularly in a roadway and parking areas such as parking ramps. The strip material and inductive loop eliminates the need for saw cutting the surface of the roadway. The material and loop has elasticity, which is required to avoid breakage due to uneven shifting or flexing of the

surface of the roadway under frequent or heavy traffic loads, thermal expansion, or structural settling. Further the material and inductive loop conforms easily to the uneven surface of the roadway including cracks and crevices. The present invention provides a protective layer over a conductor to protect the conductor from the elements and wear from vehicular traffic. A major problem in surface mounted inductive loops has been to find a flexible, extensible conductor to be constructed from generally inextensible metallic conductors. The surface mounted loop of the present invention can also be used for temporary installations because the roadway surface is not damaged. An example would be to use the surface mounted loop to obtain a traffic count to replace generally inaccurate pressure tubes.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing advantages, construction and operation of the present invention will become more readily apparent from the following description and accompanying drawings in which:

FIG. 1 is a top view showing an inductive loop installed on a roadway surface near an intersection;

FIG. 2 is a close up view of the inductive loop of FIG. 1;

FIG. 3 is an alternative geometric embodiment of the inductive loop of FIG. 2;

FIG. 4 illustrates the detailed construction of one embodiment of the strip material of the present invention;

FIG. 5 illustrates a detailed construction of an alternative embodiment of the strip material of the present invention;

FIG. 6 illustrates a detailed construction of another alternative embodiment of the strip material and inductive loop of the present invention;

FIG. 7 illustrates an example of stock material out of which the conductor used in the strip material and inductive loop of the present invention is formed;

FIG. 8 shows the conductor formed from the stock material of FIG. 7 ready for use in the strip material and inductive, loop of the present invention;

FIG. 9 shows a preferred form of the conductor to be utilized in the strip material and inductive loop of the present invention;,

FIG. 10 illustrates an alternative construction of the strip material and inductive loop of the present invention utilizing dual,, conductors; and

FIG. 11 shows one form of a splice and lead wire connection to a multiple turn inductive loop installation of the strip material of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate a surface mounted inductive loop 10 mounted on the surface of a roadway 12 with a lead wire 14 connecting the inductive loop 10 to the edge 16 of the roadway 12. The inductive loop 10 is designed to be coupled via lead wire 14 to a well known vehicle detector such as those described in the '932 Koerner and '339 Koerner patents, both of which are hereby incorporated by reference. The inductive loop 10 illustrated in FIGS. 1 and 2 is shown to be in a generally circular shape and is placed in the roadway 12 in a position designed such that the traffic to be detected passes over the inductive loop 10. In preferred embodiments of the present invention circular shapes for the inductive loop 10 of 3 feet (0.91 meters) and 4 feet (1.22 meters) diameters are preferred so that the inductive loop 10 may be placed between the wheels of the vehicular traffic in the roadway 12.

The inductive loop 10 is placed in a location of the roadway 12 where it is desired to detect the vehicles. The inductive loop 10 is placed in the traffic lane of the roadway 12 approaching the intersection. The inductive loop 10 could be used with traffic sensitive semaphores (traffic signals) or could be used for temporary or relatively permanent traffic counters. In FIGS. 1 and 2 only one inductive loop and associated lead wire 14 are illustrated. However, it is anticipated that there may be at least one inductive loop 10 at each approach to the intersection which is to be monitored and in other installations there may be one or more inductive loops 10 for each lane of vehicular traffic for each approach to the intersection. The inductive loop 10 may also be used for non-roadway applications. Examples would be use in parking areas to monitor ingress and egress as well as to monitor parking space occupancy. The inductive loop 10 can detect any conductive object of sufficient size relative to the size of the inductive loop 10 and need not be limited to the detection of only vehicles.

FIG. 3 illustrates an alternative geometric shape for the surface mounted inductive loop 10 which is again mounted on the surface of a roadway 12 with lead wire 14 connecting the inductive loop 10 to the edge 16 of the roadway 12. The inductive loop 10 illustrated in FIGS. 1 and 2 was of a generally circular shape while the inductive loop 10 illustrated in FIG. 3 is generally square. It is to be recognized and understood that the exact shape formed by the inductive loop 10 is not important as long as a general loop is formed of one or more turns of a conductor in the area over which a vehicle is desired to be detected. Whether the inductive loop 10 has a circular shape, a square shape, a triangular shape, etc. doesn't significantly matter.

The inductive loop 10 may be preformed into a specific shape or may be site-formed into the desired shape. That is, the inductive loop 10 may be distributed in strip material form or linear rolls to be formed into the circular, square or other desired shape at the site. Although it is generally preferred that the inductive loop 10 be formed from a continuous piece of the strip material, it could be formed from multiple discrete pieces of the strip material with conductive splices connecting the inductive loop where the discrete pieces are joined. Discrete pieces may be required for example with a square shaped inductive loop 10 as illustrated in FIG. 3 where a continuous piece of strip material cannot be formed around the sharp corners. If a splice in the strip material is required to form the inductive loop 10, it is preferred that the splice as described later with respect to FIG. 11 be utilized.

FIG. 4 illustrates the detailed construction of an embodiment of the strip material 18 which can be used to form the surface mounted inductive loop 10. A conductor 20 is illustrated ready to be formed to the surface of the roadway 12 and is covered with a protective covering 22. In a preferred embodiment, the strip material 18 has a width of from 2 inches (5.1 centimeters) to 4 inches (10.2 centimeters) and has an indefinite length which is as long as need be to form an individual inductive loop 10 or which may be conveniently packaged as in a roll. The conductor 20 must be ductile, flexible and extensible. The conductor 20 must maintain its conductivity even though the roadway 12 may be subject to movements in its surface because the strip material 18 is

placed over cracks in the roadway 12. The conductor 20 must be able to elongate and contract without breakage in the conductive path. In general, a conductor equivalent to a 20 gauge solid copper wire (having a resistance of about 0.033 ohms per meter at 20° C.) or larger conductor is sufficient to provide the required conductivity. The protective covering 22 must be able to protect the strip material 18 from the vehicular traffic in the roadway 12 and must further protect the strip material 18 from the elements, e.g. moisture and corrosive elements. In a preferred embodiment, an insulator is placed between the conductor 20 and the surface of the roadway 12. Although the strip material 18 is generally operable when formed into an inductive loop 10 and placed directly on the surface of a roadway 12 because the roadway 12 itself is usually a sufficient insulator. The presence of a separate insulator, however, between the conductor 22 and the surface of the roadway 12 would expand the operational environment of the strip material 18 and the resultant inductive loop 10.

FIG. 5 illustrates an alternative embodiment of the strip material 14 which may be used to form the inductive loop 10. The construction of the strip material in FIG. 5 is very similar to the construction of the strip material 18 in FIG. 4 with conductor 20 and protective covering 22. In addition, the strip material 18 in FIG. 5 has a protective underlayment 24. The protective underlayment 24 may assist in providing a dimensionally stable environment for the conductor 20 and also may assist in insulating the conductor 20 from the surface of the roadway 12. In one preferred embodiment the protective underlayment 24 may take the form of an adhesive layer to be utilized to adhere the strip material 18 forming the inductive loop 10 to the surface of the roadway 12 and, again, also serves as an insulator between the conductor 20 and the surface of the roadway 12.

A material which is similar to a preferred material for the protective covering 22 and, in certain circumstances, the protective underlayment 24 is described in U.S. Pat. No. 4,117,192, Jorgensen, DEFORMABLE RETROREFLECTIVE PAVEMENT-MARKING SHEET MATERIAL, which is hereby incorporated by reference. However, the material described in Jorgensen is not quite suitable for use in the strip material 18 of the present invention. The material in Jorgensen is designed to be easily seen on the roadway 12 since its purpose is for the marking of pavements. Hence, the material in Jorgensen has retroreflective elements designed to easily reflect incident light and further is of a color designed to easily attract attention. In contrast, strip material 18 for forming an inductive loop typically is best when it is not seen by the driver of a vehicle approaching the inductive loop 10. If the strip material 18 and inductive loop 10 is easily seen, the extra markings appearing on the surface of the roadway 12 may tend to confuse some drivers. Therefore, it is advantageous for the strip material 18 of the present invention which is to be utilized in forming an inductive loop 10 to be not very visible on the surface of the roadway 12. However the sheet material in Jorgensen has other desirable characteristics which can be utilized in the strip material 18 of the present invention, and particularly in the protective covering 22 and, in some circumstances, in the protective underlayment 24. The sheet material in Jorgensen is deformable, has elasticity, has a firm supporting structure and has adhesion to the surface of the roadway 12.

A preferred material for the protective covering 22 described in FIGS. 4 and 5 and, in some circumstances, the protective underlayment 24 in FIG. 5 would be a material which is similar to the sheet material described in Jorgensen. To be suitable, however, it would be desirable to modify the base film of the sheet material in Jorgensen. This modification would be primarily to effect a color change to adapt a color of the sheet material to a color as close as possible to the color of the surface of the roadway 12. One color which would be advantageous to develop and blend in to concrete roadways would be a grey color. Thus it is preferred that a sheet material as described in Jorgensen be developed but with a modified base sheet 32 (11 in Jorgensen). An example of such a modified base sheet 32 is a base sheet 32 constructed of the following ingredients substituted for those ingredients found in the Jorgensen patent:

Ingredient	Parts Per Hundred
Hycar 1022	16.20
Chlorowax 70-S	11.37
Chlorowax 40	2.48
Sterling R Carbon Black	1.07
Calidria Asbestos RG 100	19.50
Stearic Acid	0.56
Hi Sil 233	3.25
1.5 Refractive Index Glass Beads	45.57
Total	100.00

A further necessary modification to the material described in Jorgensen is to eliminate the retroreflective particles (namely the transparent microspheres 14 in Jorgensen) of the support film 32 (12 in Jorgensen) leaving the skid resisting particles (13 in Jorgensen).

This modified sheet material can then be used as a protective covering 22 in FIGS. 4 and 5 to form the strip material 18 used to form the inductive loop 10. The conductor 20 can simply be pressed into the adhesive contained in the sheet material, either beforehand with pencil rollers under pressure or at the site while being applied to the surface of the roadway. Further it is preferred that in the embodiment of FIG. 4 that adhesive exists between the conductor 20 and the surface of the roadway. Adhesive similar to that in the Jorgensen patent may be used for this purpose. Alternatively, an entire adhesive layer may be formed on the underside of the protective covering 22 and conductor 20 as illustrated in FIG. 5. The adhesive would then form protective underlayment 24. Again, an adhesive similar to that described in the Jorgensen patent may be utilized for protective underlayment 24. Still further, an alternative embodiment of the strip material 18 illustrated in FIG. 5 would involve a double layer of the modified sheet material described in Jorgensen with the conductor 20 sandwiched between both layers, i.e. the sheet material modified as specified above could be used for both the protective covering 22 and the protective underlayment 24. Although more expensive, a strip material 18 constructed in this manner would allow for greater protection of the conductor 20 and ensure adequate insulation for the conductor 20 from the surface of the roadway 12.

FIG. 6 illustrates an alternative embodiment of the manner in which the inductive loop 10 may be formed. In this alternative embodiment the inductive loop 10 is site formed on the surface of the roadway 12. The same conductor 20 as described in FIGS. 4 and 5 is utilized in

FIG. 6. Protective covering 26, however, takes a different form. In the embodiment of FIG. 6, the conductor 20 is placed on the surface of the roadway 12 and the protective covering 26 is formed in place over the conductor 20, both protecting the conductor 20 and adhering the conductor 20 to the surface of the roadway 12. It is preferred that the conductor 20 also be separately adhered to the surface of the roadway 12 with an adhesive similar to the adhesive suggested with respect to FIGS. 4 and 5 which, again, also acts as an insulator between the conductor 20 and the surface of the roadway 12. Examples of a material which may be used to form protective covering 26 are polyurethane, urethane, polyester and epoxy. In a preferred embodiment, the protective covering 26 is a polyurethane and in a still preferred embodiment is an ultraviolet curable polyurethane. A preferred formula for the ultraviolet curable polyurethane is as follows:

Ingredient	Manufacturer	Parts per Weight
Oligomer (PP4G6G)		40
Monomer SR-306-Tripropylene Glycol Diacrylate	Sartomer	17
Quartz Filler Imsil A-10-Micronized Amorphous Silica	Illinois Mineral	40
Photo Initiator Irgacure 651	Ciba Geigy	2
Parafin Wax		1
Pigment, Lampblack		0.01 to 0.05%

An example of the Oligomer would be the use of a polyester polyol, 1,4 butane diol neopentylglycol adipic acid, Lexorez 1640-55 (Inolex Corp.), MW 2000, EQWT 1000; Isophorone Diisocyanate, IPDI (Veba); and Hydroxyethyl Acrylate (HEA) or Methacrylate, HEMA Rohm and Haas). Other suitable polyols which may be used are polycaproloctone and polyether polyols with an acceptable MW range for desired flexibility from 1000 to 3000. Aliphatic Diisocyanate, IPDI, is preferred over Aromacics for weatherability. Monoacrylate monomers could be used over diacrylate for achieving greater flexibility. The filler is used to block visible transparency and being a quartz filler allows for ultraviolet transparency to achieve a curing. Irqacure 651 is chosen for a thorough cure. The wax is melted and dispersed into the formula to allow for curing in air since the wax forms a thin film at the surface and blocks against oxygen which inhibits the surface cure. The pigment absorbs ultraviolet light and minimizes the coating thickness to 30 mils for effective curing. A 0.01% level of pigment imparts a grey or concrete color for matching to the surface color of concrete.

One of the key ingredients in the strip material 18 in the inductive loop 10 of the present invention is the ductile, flexible, extensible conductor 20. Since metals typically have been used as conductors and since metals are generally subject to breakage when stretched, the use of a metal for the conductor 20 has been a major problem in prior art surface mounted inductive loops. This is evidenced by the inductive loop described by Universal Autopayment where a multiplicity of conductive paths are provided so that when breakage occurs in some paths still other conductive paths will remain. The present invention has two alternative embodiments of a conductor which meets the ductile, flexible, extensible criteria.

The first embodiment for the conductor 20 is illustrated in FIGS. 7 and 8. FIG. 7 illustrates a standard, copper wire braid 28. Examples of two braids 28 which may be used are Model No. 8654 manufactured by Belden and Model No. 2163 manufactured by Alpha, both of which are braided 72 strand copper tinned wires. The standard wire braid 28 is then compressed and flattened before being utilized in the strip material 18 or the inductive loop 10 of the present invention. In a preferred embodiment, the wire braid 28 which originally was 12 inches (30.5 centimeters) in length is compressed to between approximately 6 inches (15.24 centimeters) and 9 inches (22.86 centimeters) in length and when flattened becomes ⅜ inches (0.95 4 centimeters) wide instead of the original ¼ inch (0.64 centimeters) in width. The conductor 20 illustrated in FIG. 8 having been compressed and flattened from the conductive copper wire braid 28 in FIG. 7 has the extensible, flexible, ductile properties required.

The second embodiment of the conductor 20 is illustrated in FIG. 9. Conductor 20 in FIG. 9 is constructed from a copper mesh having a number of voids and providing a lattice type design. Due to the presence of the voids in the copper mesh, the conductor 20 is subject to a considerable degree of extensibility. An example of a preformed copper mesh which is suitable for use as conductor 20 is material 4CU6-050 which has been flattened and annealed.

With both of the conductors 20 in FIGS. 8 and 9, it is preferable to have the conductors 20 either "tinned" or "anti-oxidized" to protect the conductors 20 against corrosive elements. Tinned copper is a well known process by which a tin coating is added to copper to aid in soldering and inhibit corrosion. Anti-oxidant is a well known substance which prevents or slows down oxidation of the material when the material is exposed to air.

While the preferred embodiment of the inductive loop 10 is a preformed single turned loop formed from the strip material 18 with a single conductor as illustrated in FIGS. 4, 5, and 6 it is recognized that some installations may require a multiturn inductive loop and an inductive loop with a dual conductive material may be desirable for the lead wire 14 connecting the inductive loop 10 to the edge 16 of the road 12. FIG. 10 illustrates a strip material 18 which can be used for such a purpose. Strip material 18 as described in FIG. 10 can easily be used for either a multi-turn inductive loop 10 or for the lead wire 14. Strip material 18 in FIG. 10 is constructed very similarly to those constructions described in FIGS. 4 and 5 except that two conductors (20A and 20B) are contained therein. Accordingly the width of the strip material 18 may be increased to accommodate both conductors 20A and 20B. FIG. 10 illustrates the optional protective underlayment 24 and illustrates protective covering 22 containing the base sheet 30 and support film 32 construction described in Jorgensen, modified as described above. Alternatively conductors 20A and 20B may be laid directly on the surface of the roadway 12 itself, or protective underlayment 24 may be utilized which again may be an adhesive or the modified sheet material of Jorgensen. When a protective underlayment 24 is utilized, the protective underlayment 24 also serves to ensure insulation between conductors 20A and 20B.

FIG. 11 illustrates one possible means of accommodating a splice should a multiple turn inductive loop 10 be desired to be constructed or should an inductive loop 10 be desired to be constructed from discrete portions of strip material 18. With the multi-turn inductive loop 10 illustrated in FIG. 11 conductor 34 must couple to con-

ductor 36 in strip material 18 forming lead wire 14 while conductor 38 must connect with conductor 40 similarly. Meanwhile in order to form a continuous multiturn inductive loop, conductor 42 must couple directly to conductor 44. To accomplish the connection between conductor 42 and conductor 44, a separate piece of conductor 46, which may be constructed of the same material as conductor 20 as previously described, is laid diagonally between conductor 42 and conductor 44. The splice may be accomplished with solder lugs and allowed to cold flow to complete the electrical connection. Since conductor 36, in order to couple to conductor 34 must pass over the top of conductor 46 an insulator 48 must be placed over conductor 46 to protect it from conductor 36. It is preferred that insulator 48 be constructed from a polyurethane rubber sheet or from a fiberglass web. With insulator 48 in place strip material 18 forming lead wire 14 may be placed on top of the strip material 18 forming the inductive loop 10 with conductor 34 mating conductor 36 and conductor 38 mating conductor 40. Again, solder lugs and cold flow may be utilized to form the electrical connection.

Thus, it can be seen that there has been shown and described a novel strip material for forming an inductive loop. It is to be understood, however, that various changes, modifications and substitution in the form of the details of the described invention can be made by those skilled in the art without departing from the scope of the invention as described by the following claims:

What is claimed is:

1. An inductive loop adapted to be applied to the surface of a roadway, comprising:
   - a loop of a ductile, flexible, extensible, flattened, metallic mesh; and
   - a protective covering adhered to said loop, said protective covering being capable of adhering said loop to said surface of said roadway.

2. An inductive loop as in claim 1 wherein said metallic mesh is a flattened braided wire.

3. An inductive loop as in claim 2 wherein said flattened braided wire is longitudinally compressed.

4. An inductive loop as in claim 3 wherein said flattened braided wire has been longitudinally compressed to be not more than three-fourths of its extended length.

5. An inductive loop as in claim 3 wherein said flattened braided wire is constructed from a soft metal.

6. An inductive loop as in claim 1 wherein metallic mesh is constructed from a soft metal.

7. An inductive loop as in claim 6 wherein said metallic mesh has a surface area containing of from 25 percent to 75 percent voids.

8. An inductive loop as in claim 7 wherein said metallic mesh is constructed by creating diamond-shaped voids in a metallic sheet.

9. An inductive loop as in claim 1 wherein said metallic mesh is treated with an anti-oxidant to deter corrosion.

10. An inductive loop as in claim 1 wherein said protective covering comprises:
   - a base sheet;
   - a support film adhered to one surface of said base sheet; and
   - an adhesive affixed to the other side of said base sheet for adhering said wire to said protective covering and for being capable of adhering said inductive loop to said roadway.

11. An inductive loop as in claim 10 further comprising a protective underlayment placed between said conductor and said surface of said roadway.

12. An inductive loop as in claim 11 wherein said protective underlayment is insulative.

13. An inductive loop as in claim 12 wherein said protective underlayment is an adhesive.

14. A strip of material to be formed into an inductive loop adapted to be applied to the surface of a roadway, comprising:
   - a conductor of a ductile, flexible, extensible, flattened metallic mesh; and
   - a protective covering being capable of adhering said conductor to said surface of said roadway.

15. A strip material as in claim 14 wherein said metallic mesh is a flattened braided wire.

16. A strip material as in claim 15 wherein said flattened braided wire is longitudinally compressed.

17. A strip material as in claim 16 wherein said flattened braided wire has been longitudinally compressed to be not more than three-fourths of its extended length.

18. A strip material as in claim 15 wherein said flattened braided wire is constructed from a soft metal.

19. A strip material as in claim 14 wherein metallic mesh is constructed from a soft metal.

20. A strip material as in claim 19 wherein said wire mesh has a surface area containing of from 25 percent to 75 percent voids.

21. A strip material as in claim 20 wherein said metallic mesh is constructed by creating diamond-shaped voids in a metallic sheet.

22. A strip material as in claim 14 wherein said metallic mesh is treated with an anti-oxidant to deter corrosion.

23. A strip material as in claim 14 wherein said protective covering comprises:
   - a base sheet;
   - a support film adhered to one surface of said base sheet; and
   - an adhesive affixed to the other side of said base sheet for adhering said wire to said protective covering and for being capable of adhering said inductive loop to said roadway.

* * * * *

PCT

NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

H.R. HODGKINSON & CO.
Level 3, 20 Alfred Street
Milsons Point, New South Wales 2061
AUSTRALIE

Date of mailing (day/month/year) 11 August 2000 (11.08.00)	
Applicant's or agent's file reference 2601C	**IMPORTANT NOTIFICATION**
International application No. PCT/AU00/00644	International filing date (day/month/year) 08 June 2000 (08.06.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 08 June 1999 (08.06.99)
Applicant MORRIS, James, Frederick	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).

2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.

3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
08 June 1999 (08.06.99)	PQ 0851	AU	18 July 2000 (18.07.00)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Céline Faust

Telephone No. (41-22) 338.83.38

WO 00/75906
PCT/AU00/00644

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

To:
H.R. HODGKINSON & CO.
Level 3, 20 Alfred Street
Milsons Point, New South Wales 2061
AUSTRALIE

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

Date of mailing (day/month/year)	
14 December 2000 (14.12.00)	
Applicant's or agent's file reference 2601C	**IMPORTANT NOTICE**

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/AU00/00644	08 June 2000 (08.06.00)	08 June 1999 (08.06.99)

Applicant
MORRIS, James, Frederick

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AG,AU,DZ,KP,KR,MZ,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   14 December 2000 (14.12.00) under No. WO 00/75906

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

PLP

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer
J. Zahra

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

H.R. HODGKINSON & CO.
Level 3, 20 Alfred Street
Milsons Point, New South Wales 2061
AUSTRALIE

INFORMATION CONCERNING ELECTED OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

Date of mailing (day/month/year)	
07 February 2001 (07.02.01)	
Applicant's or agent's file reference	**IMPORTANT INFORMATION**
2601C	

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/AU00/00644	08 June 2000 (08.06.00)	08 June 1999 (08.06.99)

Applicant
MORRIS, James, Frederick

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

   AP :GH,GM,KE,LS,MW,MZ,SD,SL,SZ,TZ,UG,ZW
   EP :AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE
   National :AU,BG,CA,CN,CZ,DE,IL,JP,KP,KR,MN,NO,NZ,PL,RO,RU,SE,SK,US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

   EA :AM,AZ,BY,KG,KZ,MD,RU,TJ,TM
   OA :BF,BJ,CF,CG,CI,CM,GA,GN,GW,ML,MR,NE,SN,TD,TG
   National :AE,AG,AL,AM,AT,AZ,BA,BB,BR,BY,CH,CR,CU,DK,DM,DZ,EE,ES,FI,GB,GD,
   GE,GH,GM,HR,HU,ID,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MW,MX,
   MZ,PT,SD,SG,SI,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW

3. The applicant is reminded that he must enter the "national phase" **before the expiration of 30 months from the priority date** before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

   Some offices have fixed time limits expiring later than the above-mentioned time limit: For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

   The entry into the European regional phase is postponed **until 31 months from the priority date** for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer:
A. Karkachi

Telephone No. (41-22) 338.83.38

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 2601C

Box No. I TITLE OF INVENTION

IMPROVEMENTS IN ELECTROMAGNETIC TRAFFIC SIGNAL DETECTION

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

MORRIS, James Frederick
15 Koorong Street
Berowra
New South Wales 2081
Australia

[X] This person is also inventor.

Telephone No. 02 9456 2262

Facsimile No. 02 9456 0200

Teleprinter No.

State *(that is, country)* of nationality: Australia

State *(that is, country)* of residence: Australia

This person is applicant for the purposes of: [X] all designated States [ ] all designated States except the United States of America [ ] the United States of America only [ ] the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:

[ ] applicant only

[ ] applicant and inventor

[ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: [ ] all designated States [ ] all designated States except the United States of America [ ] the United States of America only [ ] the States indicated in the Supplemental Box

[ ] Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: [X] agent [ ] common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

H.R. HODGKINSON & CO.
Level 3, 20 Alfred Street
Milsons Point
New South Wales 2061
Australia

Telephone No. 02 9922 3199

Facsimile No. 02 9956 6448

Teleprinter No.

[ ] Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the address to which correspondence should be sent.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

☒ AP **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☒ EA **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ EP **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☒ OA **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

☒ AE United Arab Emirates
☒ AL Albania
☒ AM Armenia
☒ AT Austria
☒ AU Australia
☒ AZ Azerbaijan
☒ BA Bosnia and Herzegovina
☒ BB Barbados
☒ BG Bulgaria
☒ BR Brazil
☒ BY Belarus
☒ CA Canada
☒ CH and LI Switzerland and Liechtenstein
☒ CN China
☒ CR Costa Rica
☒ CU Cuba
☒ CZ Czech Republic
☒ DE Germany
☒ DK Denmark
☒ DM Dominica
☒ EE Estonia
☒ ES Spain
☒ FI Finland
☒ GB United Kingdom
☒ GD Grenada
☒ GE Georgia
☒ GH Ghana
☒ GM Gambia
☒ HR Croatia
☒ HU Hungary
☒ ID Indonesia
☒ IL Israel
☒ IN India
☒ IS Iceland
☒ JP Japan
☒ KE Kenya
☒ KG Kyrgyzstan
☒ KP Democratic People's Republic of Korea
☒ KR Republic of Korea
☒ KZ Kazakhstan
☒ LC Saint Lucia
☒ LK Sri Lanka
☒ LR Liberia
☒ LS Lesotho
☒ LT Lithuania
☒ LU Luxembourg
☒ LV Latvia
☒ MA Morocco
☒ MD Republic of Moldova
☒ MG Madagascar
☒ MK The former Yugoslav Republic of Macedonia
☒ MN Mongolia
☒ MW Malawi
☒ MX Mexico
☒ NO Norway
☒ NZ New Zealand
☒ PL Poland
☒ PT Portugal
☒ RO Romania
☒ RU Russian Federation
☒ SD Sudan
☒ SE Sweden
☒ SG Singapore
☒ SI Slovenia
☒ SK Slovakia
☒ SL Sierra Leone
☒ TJ Tajikistan
☒ TM Turkmenistan
☒ TR Turkey
☒ TT Trinidad and Tobago
☒ TZ United Republic of Tanzania
☒ UA Ukraine
☒ UG Uganda
☒ US United States of America
☒ UZ Uzbekistan
☒ VN Viet Nam
☒ YU Yugoslavia
☒ ZA South Africa
☒ ZW Zimbabwe

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

☐ .....
☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant [illegible] within the 15-month time limit.)

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) (08.06.99) 8 June 1999	PQ 0851	Australia		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): _____

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*

ISA/

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date (day/month/year)	Number	Country (or regional Office)
18 June 1999	99/1136	Australia

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request	:	3
description (excluding sequence listing part)	:	6
claims	:	2
abstract	:	1
drawings	:	2
sequence listing part of description	:	
Total number of sheets	:	14

This international application is accompanied by the item(s) marked below:

1. ☐ fee calculation sheet
2. ☒ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

MORRIS, James Frederick

BY: .....

Patent Attorney for the Applicant
H.R. Hodgkinson & Co.

For receiving Office use only

1. Date of actual receipt of the purported international application:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA/
6. ☐ Transmittal of search copy delayed until search fee is paid.

2. Drawings:
☐ received:
☐ not received:

For International Bureau use only

Date of receipt of the record copy by the International Bureau: